Before the
**FEDERAL COMMUNICATIONS COMMISSION**
Washington, D.C. 20554

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| In the Matter of | ) | |
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| Allocation of Spectrum in the | ) | RM-8653 |
| 5 GHz Band to Establish a | ) | |
| Wireless Component of the | ) | |
| National Information Infrastructure | ) | |



To: The Commission

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# REPLY COMMENTS OF THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

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**SUMMARY**

The American Radio Relay League, Incorporated (the League), the national association of amateur radio operators in the United States, submits its reply to certain of the comments filed in response to the Petition for Rule Making (the Petition) which was filed on or about May 24, 1995 by Apple Computer, Inc. (Apple). The League has a continuing interest in unimpaired access by radio amateurs to the 5.650-5.925 GHz band, and in light of the Apple proposal for potentially incompatible use of the 5.725-5.875 GHz segment.

The comments on both the WINforum petition (RM-8648) and the Apple petition fall into certain defined categories. A significant number of comments supported only the general concept of unlicensed access to a shared unlicensed personal radio network. Those comments were from individuals and others interested in available electronic media with simple, low-cost, easy access for all Americans, and the availability of high-speed, wireless transmission of video, voice and data on an unlicensed basis. The comments supportive of the Apple petition were non-technical in their analysis, and none offered substantive comment on the choice of frequency band(s) advocated by Apple, or the technical parameters which could or should be applied to Apple's proposed unlicensed service. The League has no quarrel with the desirability of increased availability of the electronic resources of the National Information Infrastructure (NII).

On the other hand, those commenters which did discuss the technical implications of the WINforum and Apple petitions were unanimous in suggesting that the WINforum proposal for the use of the frequencies around 5.0-5.25 GHz should be studied further, and that the Apple proposal for a bifurcated 300 MHz allocation, with 150 MHz of that in the 5.7-5.8 GHz range, was not desirable. There was uniform criticism of the absence of technical sharing studies in the Apple petition, and many noted, as did the League, that the Apple petition was notably, inadequately supported.

Overall, given the technical incompleteness of the Apple petition, the Commission should not commence any further proceeding based on it. The Commission has insufficient information with which to make any specific allocation proposal.

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**To: The Commission**

**REPLY COMMENTS OF THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED**

The American Radio Relay League, Incorporated (the League), the national association of amateur radio operators in the United States, by counsel and pursuant to Section 1.405(b) of the Commission's Rules (47 C.F.R. §1.405(b)), hereby respectfully submits its reply to certain of the comments filed in response to the Petition for Rule Making (the Petition) which was filed on or about May 24, 1995 by Apple Computer, Inc. (Apple). In the continued interests of the Amateur Service in unimpaired access to the 5.650-5.925 GHz band, and in light of the Apple proposal for potentially incompatible use of the 5.725-5.875 GHz segment, the League states as follows:

## I. Overview of the Comments

1. The comments on both the WINforum petition (RM-8648) and the Apple petition fall into certain reasonably well-defined categories. A significant number of comments supported only the general concept of unlicensed access to a shared unlicensed personal radio network. Those comments were from individuals and

others interested in the philosophy of the Apple petition: available electronic media with simple, low-cost, easy access for all Americans, and the availability of high-speed, wireless transmission of video, voice and data on an unlicensed basis. Indeed, it is a currently popular concept. The comments supportive of the Apple petition[1] were, however, without exception, non-technical in their analysis, and none offered substantive comment on the choice of frequency band(s) advocated by either Apple, or the technical parameters which could or should be applied to Apple's proposed unlicensed service. The League, like these supporting commenters, has no quarrel with the desirability of increased availability of the Internet and other electronic resources of the National Information Infrastructure (NII).

2. On the other hand, those commenters which did discuss the technical implications of the WINforum and Apple petitions were unanimous in suggesting that the Winforum proposal for the use of the frequencies around 5.0-5.25 GHz should be studied further, and that the Apple proposal for a bifurcated 300 MHz allocation, with 150 MHz of that in the 5.7-5.8 GHz range, was not desirable. There was uniform criticism of the absence of technical sharing studies

[1] The League has no interest in the WINforum proposal, which does not propose the unlicensed use of any Amateur Radio allocation. For a number of reasons stated herein and in prior comments, the League suggests that if the Commission is inclined to proceed with an allocation for unlicensed wireless data facilities (in addition to its other accommodations of late for similar wireless data operation), it should consider the WINforum proposal rather than the Apple petition.

in the Apple petition, and many noted, as did the League, that the Apple petition was notably, inadequately supported.

3. Overall, given the technical incompleteness of the Apple petition, the Commission should not commence any further proceeding based on it. The Commission has insufficient information on the face of the petition (and the comments offer no more technical support to the proposal) in order to make any specific allocation proposal. This flaw in the Apple petition was made abundantly clear in the comments.

## II. Comments Do Not Support A 5.7-5.8 GHz Allocation For Unlicensed NII Part 15-Type Service

4. Comments which address more than just the general philosophy of the "NII Band" proposed by Apple favor the somewhat different allocation plan (and somewhat different concept) proposed by WINforum. Perhaps the best concise explanation of the important differences in the two proposals was enunciated by AT&T:

> WINforum's concept of short-range, predominantly indoor, usage supports wideband, high data rate applications, facilitates efficient spectrum re-use and maximizes the ability of many different kinds of devices to share the band. Moreover, the WINforum proposal does not artificially constrain the kinds of applications permitted in the new spectrum and calls for broad industry consensus to develop the necessary technical rules and standards.
>
> On the other hand, Apple's high power, long range, community network proposal will likely resemble a licensed service, and will threaten the development of licensed PCS services and the ability of MSS feeder links to operate in the band. Moreover, the Apple concept is spectrally inefficient and limits user choice of technology and applications.
>
> (AT&T Comments, at 2)

5. AT&T noted that there were three proposals (including AT&T's own proposal for an allocation at WRC-95 in the 5 GHz range) for high-speed wireless data. AT&T proposed an allocation of 250 MHz at 5.0-5.25 GHz, and WINforum proposed an allocation of 250 MHz at 5.1-5.35 GHz. Apple alone proposed an allocation of only 150 MHz in the 5.15-5.3 GHz band, and an additional segment at 5.725-5.825 GHz. While AT&T agrees that there is a potential need for an allocation of 250 MHz in the near term, it does not support the Apple proposal, specifically with respect to the 5.7-5.8 GHz portion thereof. While AT&T's comments failed to account for the needs and concerns of the Amateur Service in the 5.7-5.8 GHz band, AT&T nonetheless notes some of the major flaws in the Apple allocation plan:

> Because high-speed wireless data applications are quite likely to need more than 250 MHz in the future, AT&T would not object to an allocation of 300 MHz at this time. However, Apple's particular proposal should not be adopted. Industrial, Scientific and Medical ("ISM") equipment is permitted to operate in the 5.725-5.875 GHz band on a superior basis to unlicensed high-speed wireless data use. The delays inherent in considering and resolving current and potential conflicts between these two uses demonstrate that this aspect of Apple's proposal does not fulfill the need to move forward now on a spectrum allocation for the wireless operation all three parties seek.
>
> A second objection to 5.725-5.875 GHz for high speed wireless data is that that band is presently available to spread spectrum Part 15 devices. Apple concedes that the Part 15 devices will have to conform to NII band rules, and predicts that "slight adjustments" in Part 15 products may be required in only "a limited number of cases"... Surely, Part 15 devices would have to conform to the SUPERNet etiquette if the 5.725-5.875 GHz band were allocated for that purpose. AT&T is concerned that such adjustments may not be as easy as Apple suggests. Because of the many valuable contributions made by Part 15 devices, recognized in several recent Commission

> decisions (citation omitted) allocation of spectrum used by those devices to a use that may well cause difficulties should be avoided.
>
> (AT&T Comments, at 4-5)

To this, the League would add that there is absolutely no analysis in the Apple petition of the compatibility between the unlicensed high-speed, long-range data service proposed by Apple, and existing and proposed amateur operation at 5.725-5.875 GHz. Surely, given the proposed 10-15 km ranges and bandwidths proposed by Apple, there is a significant incompatibility between that use and increasing amateur radio operation in the band. This point was, however, addressed by a number of the amateur commenters in this proceeding, discussed hereinbelow.

6. The comments of Andrew Corporation make a similar point, and appropriately caution the Commission, in considering such allocation proposals, to "weigh the interests of existing users, current investment, the impact of other Commission policies, and the projected benefits of proposed new allocations."[2] Andrew further states that the Commission should not grant that part of Apple's petition that proposes to reallocate the upper band (5.725-5.875 GHz) as proposed by Apple. Such would be inconsistent with spread-spectrum Part 15 operations and Part 18 ISM operation. Andrew notes that, while wireless NII operation in the 5.8 GHz band would disrupt existing uses in the band, it would not further the goals of Apple: Andrew questions the need for an allocation of more than 150 MHz at this time for Apple's purposes, and asserts that a

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[2] Andrew Comments, at 5.

150 MHz allocation at 5.3 GHz would be sufficient to accomplish the stated goals of faster access to networks and information transfer. It would also provide a means of wireless access via community networks, schools and libraries that is of sufficient magnitude. The stated benefits of a 300 MHz allocation, to produce the "luxury" of full duplex operation and "future developments", are too speculative to warrant the disruption and harm to existing services at 5.7-5.8 GHz.

7. The League agrees wholeheartedly that existing services are not adequately protected under the Apple petition as stated, and the petition is insufficient on its face to justify further Commission action with respect to the upper segment proposed for allocation. Perhaps most importantly, the Andrew comments note that in Europe, the HYPERLAN family of wireless products conform to internationally agreed-upon standards, in an allocation which in some countries occupies only 100 MHz; thus, a 300 MHz allocation at this time is hardly required in order to achieve consistency with international standards. Apple has no other reason why an allocation of the magnitude requested is necessary now.

8. The comments of the Federal Aviation Administration (FAA) offer an additional perspective on the matter of a 5 GHz allocation for Apple's "NII band" concept. FAA recommends that the NII band system be encouraged to exploit spectrum above 10 GHz. FAA also states that the unregulated nature of the "community networks" proposed by Apple negate any attention to sharing considerations.

9. Digital Microwave Corporation (DMC) supports the WINforum proposal, but not the Apple proposal, due to similar sharing concerns. DMC states that:

> Apple in its Petition proposes that the 5150-5300 and 5725-5875 MHz (bands) be allocated for its "NII Band" proposal whereas WINFORUM proposes 5100-5350 MHz for SUPERNET. The former involves 300 MHz in two bands and the latter 250 MHz in a single allocation. Considering the "value" of 5 GHz spectrum to many other services and as a matter of good spectrum management, DMC urges the Commission to adopt the WINFORUM spectrum allocation proposal.
>
> Both Petitioners make references to the ability of their unlicensed services to share with other services, e.g. Mobile Satellite and Federal Government radars. The Commission should note that there is no demonstration in the Petitions that this sharing is feasible. In any event, the WINFORUM petition, proposing a single band of 250 MHz, would narrow the spectrum sharing problems.
>
> (Digital Microwave Corporation comments, at 3)

10. As these comments demonstrate, there are, even among those who support the concept of an unlicensed wireless data allocation, significant differences of opinion in how to proceed. It is clear that there is little support for the specific allocation proposal of Apple, and that if the Commission is inclined to proceed further with the Apple concept, it should avoid any allocation proposal that includes the 5725-5875 MHz band.

## III. The Comments Note The Absence of Requisite Sharing Studies and Necessary Technical Rules Proposals

11. The comments that offered more than mere "cheerleading" in favor of the Apple "NII band" concept were unanimous in noting the

technical inadequacy of the Apple petition.[3] These included DMC, which stated that "DMC suggests that the Commission be concerned about the lack of assurances that all users could participate in the unlicensed services on an equal basis. In other words, prior to proceeding to rule making, the Commission should include specific rules on power levels to assure sharing would be realistic."[4] The major concern of the comments, however, is less about sharing between and among unlicensed data operations; it was, rather, relative to sharing between unlicensed data users and those currently occupying the bands in other services. As stated by Constellation Communications, an MSS proponent and applicant:

> The basic technical problem raised by these petitions is that they do not present any technical parameters to define and limit the proposed operations, nor any convincing sharing analyses to demonstrate that harmful interference will not be caused to LEO MSS feeder links operating in the 5 GHz band (footnote omitted). In order to demonstrate compatibility, the petitioners must show that the aggregate power transmitted by all of the unlicensed wireless data transmitters within the LEO MSS satellite receiving beam can be limited to an acceptable value that does not significantly degrade the performance of the LEO MSS feeder link.
>
> The only interference calculation provided is based on the Hyperlan parameters.(footnote omitted). However, that calculation includes assumptions on a number of significant interference parameters, such as user activity factors, ratio of indoor/outdoor users, and building attenuation, which have not been shown to be representative of the unlicensed wireless data transmission networks envisioned by the petitioners.
>
> *****

[3] The Apple comments offered no further insight into the technical operating parameters or sharing considerations in the subject bands than did its original petition.

[4] DMC Comments, at 3-4.

> To make matters worse, Apple contemplates the use of unlicensed outdoor links with path lengths on the order of 10 km or more. Such operations could increase transmit powers (and thus interference) by a factor of 25 dB or more...
>
> Because the petitioners do not provide specific technical rules or the technical characteristics of the transmitting equipment that would be eligible for unlicensed operations, it is not clear that the 5 GHz band is the most suitable one for the types of operations envisioned by the petitioners. Specific technical concepts and parameters are needed for full consideration of the proposed rule making petitions. For example, other bands that are potentially usable for unlicensed operations, particularly at 900 MHz, 1.8-1.9 GHz (PCS) band, 28 GHz and 40 GHz. Given these options, it is important that the petitioners provide convincing analyses of why 5 GHz is needed. The lack of technical specificity of the proposed network characteristics and operations do not provide a clear enough definition of requirements that permits an adequate review of which available bands are the most suitable for unlicensed, high data rate wireless data transmission networks.
>
> (Constellation Communications comments, at 2-5)

12. Other comments were similar. The FAA indicated, relative to potential interference to ARNS facilities, that it required a sharing study that would include the following three elements: 1) verifiable worst-case emission characteristics of the NII band system(s), from a sharing point of view; 2) verification of spectrum requirements; and 3) verification that no other frequency band is available, and why. Similar showings were called for by the Fixed Point-to-Point Communications Section, Network Equipment Division of the Telecommunications Industry Association (TIA) and by Alcatel Network Systems, Inc., which each suggested that the proposed 5 GHz allocations should not be adopted until 1) restrictions on point-to-point paths are imposed; 2) appropriate

EIRP limitations are established; and 3) necessary band sharing with existing services is demonstrated to be attainable.

13. AT&T noted that the Apple petition contains no details concerning the organization of the "community networks" or how the groups of users manage to organize themselves, or how they can prevent others from simply buying an unlicensed device and then free riding on the efforts of the creators of the community network. The Apple proposal to allow communications on the order of "10 to 15 km or more" makes the problems much worse. The site interconnection required for Apple's community network proposal is not an optimum use of scarce spectrum for wireless operations. Cable, fiber or microwave radio links would be more suitable, according to AT&T. AT&T further notes that unlicensed operations cannot be coordinated with licensed services, but such coordination is very important in case of significant outdoor use and relatively high EIRP required to achieve the range contemplated by Apple. On the other hand, the lower powered, shorter range equipment specified by WINforum would not, says AT&T, require coordination.

14. The League suggests that AT&T has hit upon the real reason why Apple's petition contains no sharing studies, and why it focuses instead only on the alleged social benefits of its "NII band" proposal. **There is no real possibility of compatible sharing between high EIRP, long range 5 GHz unlicensed operation and existing mobile and fixed licensed users.** As the result, it is necessary to assume that the Apple proposal would result in the usurpation of the entire 5.725-5.875 GHz segment, if allocated for

"NII band" operation, and that amateurs and others would not be able to predict interference, nor prevent such to consumer devices. There is no real compatibility, and Apple only hints at that admission. For that reason, as AT&T suggests, the more realistic proposal of WINforum for lower powered devices below 5.3 GHz should be considered, rather than the Apple proposal.

15. Nor does the League accept the argument of Microsoft, which states that it is "premature to specify much about the technology to be deployed"... and that "(p)ower and antenna constraints should be flexible to enable useful coverage areas so that a single device should provide neighborhood or campus-wide access or powered at a low level for wireless LAN access."[5] **If the technical operating parameters of a new radio service that is supposed to operate in a shared band with other radio services of known parameters cannot be determined, it is premature in the extreme to consider an allocation for that new service.** If the petitioners were proposing to operate within the constraints of current Part 15 field strength limitations, that would be one thing. To suggest that an allocation should be implemented, and that the technical operating parameters (and hence sharing criteria) should be developed later, is to place the cart far before the horse; Apple has the order of things precisely backwards.

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[5] Microsoft comments, at 5.

## IV. The Amateur Service Has Important Uses For The 5.650-5.925 GHz Band Which Stand To Be Disrupted

16. The comments of amateur radio groups and individuals in this proceeding reveal a mature and expanding user group in the 5.650-5.925 GHz band, with varied, ongoing uses which stand to be disrupted should the Commission propose an allocation for Apple's "NII band" at 5.725-5.875 GHz. The comments of the Southern California Repeater and Remote Base Association provide a good analysis of amateur use of the band:

> The next amateur band is the 5.6 GHz band. This is the first microwave band with enough space for high and medium density duplex fixed relay operations, space to earth and earth to space satellite operations, and weak signal activities. The performance characteristics of this band allow the reliable operation of moderately long distance point-to-point paths (to and beyond 100 km)...(T)he 5.850-5.925 GHz portion of the 5.6 GHz amateur band...is also allocated for amateur earth-to-space and telecommand operations. The segment from 5.830 to 5.850 (GHz) is already allocated for amateur space-to-earth operations. It is clear that fixed relay operations in (the) 5.830-5.850 GHz segment, while possible on case-by-case coordination, (is) generally not desirable. The segment from 5.759-5.761 GHz is where the weak signal communications activities occur. The amateur stations operating in this segment operate with very high power and very high gain antennas and very sensitive receivers. These stations often have sufficient performance to produce transmitted signals well above +60dBw ERP. These stations must have their operating frequencies totally free of interfering signals in order to receive the extremely weak signals encountered in this type of activity. These stations often point their antennas at the horizon in order to utilize tropospheric scatter or ducting modes. The band plans utilized by amateurs all around the country successfully provide protection to and from these weak signal activities.
>
> (SCRRBA comments, at 7-8)

17. Other comments from amateur microwave user groups are similar. The Commission must take into account, when considering

the Apple petition, that Apple has utterly failed to consider interference characteristics, or even the types of uses made by amateurs of the 5.725-5.875 GHz segment. The potential for interference to the unspecified, unlicensed digital devices from amateur operations in this band segment is also significant. The Commission has clearly established that it has not the wherewithal to resolve such interference on a case-by-case basis. Thus, the inevitable result of incompatible sharing plans is that the consumers of the offended unlicensed devices are left angry and frustrated, and the inevitable target of that frustration is the amateur licensee.[6] Apple is naive to make a proposal such as this without addressing the interference problems that would result. On the one hand, Apple presumes compatibility without any analysis in support of the bare allegation.[7] On the other, it indicates a

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[6] As SCRRBA put it in anecdotal form at page 12 of its comments:

> Even if the amateur allocation is primary to the "NII Band" unlicensed operations, the amateur will be forced to cease operations. Visualize explaining to the university president that the new million-dollar wireless network providing computer network access around the campus and to the "National Information Superhighway" cannot operate when the university amateur radio station is conducting moonbounce or tropospheric scatter experiments or controlling the amateur station via a fixed relay. The amateur station will be summarily told to cease operations and may even be thrown off campus...this is hardly an acceptable way of "meshing with,,,most all existing or planned uses." (footnote omitted).

[7] See the Apple petition, Section VI at 2.

necessity for "protected spectrum".[8] The comments of amateurs in this proceeding note the flaws in this reasoning.

18. In short, the Amateur Service has active weak signal operations within the segment proposed by Apple for its NII band allocation. It has satellite uplink and downlink segments in and adjacent to the proposed NII band segment; and it has a large number of fixed point-to-point relay and control facilities, most on hilltops and mountain tops at communications sites. The potential interference to and from these facilities, if Apple's NII band proposal is adopted, is quite significant, and Apple has made no effort to address the issue substantively. The petition is defective and must be dismissed, insofar as it relates to an allocation above 5.3 GHz.

**V. Summary**

19. The comments in this proceeding firmly bolster the comments made earlier by the League: that the Apple petition is premature and is not ripe for adjudication by the Commission as it stands. While there are "cheerleader" comments which support both the Apple and WINforum concepts, these do not address any of the technical sharing considerations which are prerequisite to any serious allocation proposal. The comments which addressed the technical issues inherent in the Apple petition universally favored the somewhat different WINforum proposal, for a 250 MHz allocation below 5.3 GHz for shorter range wireless LAN facilities. None of those who address the technical sharing issues favored the

[8] See the Apple petition, Summary at 2, petition at 4.

bifurcated 300 MHz proposal of Apple. There are indeed good reasons for rejecting it, each related to the need to protect other existing users.

20. Moreover, Apple's concept is for a relatively long-range, high-EIRP communications system that bears all the trimmings of a licensed radio service. The WINforum proposal is preferable in this respect as well, since it envisions a shorter-range, low-power service which, due to the choice of frequency band, would avoid interaction between the consumer digital devices and geographically co-located, co-channel amateur stations, which operate at potentially high power. There is no possibility whatsoever of coordinated operation at 5.725-5.875 GHz as between amateur stations and unlicensed "community networks", and in fact there is no organizational structure envisioned by Apple. The proposal is amorphous in the extreme, and must be fleshed out, complete with technical rules, before the Commission can be fairly asked to consider it. That not having been done, the Apple petition is defective as well as premature, and cannot be acted upon by the Commission.

Therefore, the foregoing considered, the American Radio Relay League, Incorporated again requests that the Commission take no

further action toward allocation of the 5725-5875 MHz band, but rather should dismiss the Apple petition forthwith.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I, Margaret A. Ford, Office Manager of the law firm of Booth, Freret & Imlay, do certify that copies of the foregoing REPLY COMMENTS OF THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED were mailed this 25th day of July, 1995, via U. S. Mail, postage prepaid, first class, to the offices of the following:

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